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TREE CROPS FOR DRY LANDS

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ONE of the greatest and most triumphant agricultural booms in the world is to be found in Africa—the dry-land farming of central Tunis, where the rainfall is less than ten inches. This success is astonishing in the face of the uncertainty, dread, and failure that harass our own as yet unadjusted dry-land agriculture. As an evidence of local failure I would cite the observations of an agricultural scientist on a recent ninety-mile journey in the southern part of the Great Plains, where the rainfall averages twenty inches. In the ninety miles traversed there was but one surviving settler and not even a cattle-ranch. The dry farmers had pushed out the cattlemen, and the recent droughts had pushed out the dry farmers—all but one—in a strip as long as from New York to Philadelphia. Our uncertainties arise under a rainfall of ten to twenty inches. The African's complacency is assured by less than ten inches. Subscriptions have recently been taken up for people living in an average rainfall of sixteen to eighteen inches. Where Simpson failed, the average is seventeen inches. Yet the complacent success in Tunis is in the vicinity of Sfax, where in seven consecutive years the total rainfall amounted to forty-one inches—five and eight-tenths per year.

THE OLIVE IN TUNIS

The Tunisian rain is a winter rain, which is the best kind for dry farming, but beyond that there are not many extenuating circumstances in the climate. It is so near the Sahara that it is a thorny camel-pasture, and the frequent siroccos of the summer season are fearful driers. There are no permanent streams. The Tunisian success depends upon the fact that the Arabs long ago worked out to a finish the dust-mulch practice (which we recently "discovered" with such a hurrah), and, further, they and their French copyists have applied it to a crop that suits the environment: olives—*a tree crop.*

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The Sfax dry-farming boom is an olive boom. I rode out of Sfax in three directions—twelve miles, seventeen miles, and eighteen miles, respectively, and always in olive-orchards. They lined the road on both sides. Near the town they were from forty to eighty years old. Farther out the trees were younger, and the new plantations are still spreading. I rode one hundred miles to the south, and at the end of the journey the gray-green of the olive-trees was still to be seen. Although most of the intervening distance was bare of them, there were enough plantations *en route* to show that it was all olive ground. I passed groups of tenting Arabs on their camels, saw their camps set back a safe distance from the good French road, and their invaluable "ships of the desert" browsing on the scattering thorn-bushes. Here was the life that had for ages prevailed on the edge of the Old World deserts. The nomad in his tents of camel's hair pauses awhile where the browsing is good, then, packing his chattels, his children, and his wives, on the camels, he follows his flock where fancy (and browsing) dictate. Passing these ancient scenes, it was almost uncanny to come suddenly upon a two-thousand-acre plantation of healthy young olive-trees stretching away across the well-tilled plain as far as the eye could see.

In one direction, I was told, the plantings extend almost solidly for one hundred miles. The seven years with the combined rainfall of forty-one inches seem to have had no bad effect on the boom or on the trees. The plantings would be much more extensive than they are if it were not for the fact that the government fears that plantings will exceed labor supplies, and will not, at present, release any more of the camel-range for olive-planting. The government is actually going out and destroying young olive-plantations of the Arabs. This happens because the lands in question were set apart by treaty for the tribal use of the tenting Arab. His use consists in tenting where he pleases, pasturing where he pleases, and planting a patch of barley where he pleases. If he can plant barley, he reasons that he can also plant olives, even if the trees will live a thousand years with care. But the government thinks differently, tears up his trees, and restores the land to the primeval uses prescribed by treaty. This desire of the tenting Arab to settle down where he can be secure (the French give security) is interesting, and the willingness of this hundred-generation nomad to plant trees and wait fifteen years for profits is surprising.

It is the universal practice in this region to water the young tree three times a summer for three summers, and to plant barley

in the young orchard for about six winters. Then comes clean culture—the dry-farming dust mulch. The tree begins to bear at six and seven years, but the income is not expected to meet expenses until the trees are fifteen or twenty years old. "The man who plants the olive does not get the profit", they say in Tunis; but it is astonishing how widely they plant them, nevertheless. Here, as elsewhere, the olive has a habit of bearing a big crop one year and a light crop the next, in which it greatly resembles the fallow-year-wheat-year combination of American dry-farming.

This land has almost no value as pasture, and when the government releases it, it is virtually given away; but at twenty-one years of age the seven or ten olive-trees that are on an acre increase its value to $100 or $150. If well cared for, the average yield is from 800 to 1,100 pounds of olives, worth at the present price, from fourteen to twenty dollars to the grower. The gathering of the crop requires from four to six days'—Arab days'—work per acre. The oil yield is thirty or thirty-three per cent of the weight of the olives.

The Tree Crop and The Grain Crop

Among intelligent Tunisians there is no discussion as to which is more certain, a tree crop or a grain crop. They *know* that they cannot depend on grain. It is authoritatively stated that in one locality, even more arid than Sfax, the barley gives in ten years two good crops, three mediocre crops, and five failures, while the olive gives in three years one good crop, one mediocre crop, and one failure—a sixty-per-cent crop advantage in favor of the olive, with less work. This is on the very edge of the Sahara, where the natives have been growing olives for unknown centuries—probably for two thousand years, and it may be longer than that.

Why does the tree crop beat the grain crop in the great fight for scanty water? There are many reasons, and good ones. If, as Napoleon said, victory goes to the army with the heaviest artillery, the water will certainly go to the plant with the longest roots.

The Carob-Tree

Monsieur Trabut, Government Botanist of Algeria, in speaking of the deep-rooted habits of trees, has told me that in a newly dug well he had seen the roots of a carob-tree sixty feet below the surface. The carob fed John the Baptist, the Prodigal Son, and the Scriptural swine. Its nutritive value is undiminished. From that day to this the carob bean has been a

regular crop in the drier Mediterranean lands, because it is an avid searcher after water, and one of the best crops for arid, unirrigable lands. In Portugal, Spain, North Africa, and many other Mediterranean lands it is still feeding the pig, the donkey, the horse, the man, and it is surprising to find how many Americans have eaten St. John's bread in our Eastern cities, where it is often to be had on fruit-stands.

The Adaptive Power of the Olive

It is the general opinion in Sfax that the olive there is a shallow rooter. Studies of the olive-trees of the Colorado Desert, California, conclusively show that this is the case there. It would be a foolish tree that would send its roots into a bone-dry subsoil such as exists beneath many deserts. The desert tree, particularly the olive-tree, adjusts itself to this environment by developing surface roots that spread over a great area with a network of feeding rootlets ready to seize and hold the slightest shower that moistens the dust. Twenty-year-old olive-trees in the Colorado Desert showed root areas seven to nine times as great as the areas covered by the spread of the branches.

Along with this the olive, like other desert plants, has developed an almost marvelous power of water storage, so that last year's rain is really the important thing for this year's crop.

The Tree Crop and Dry Farming

One great factor of especial interest to the believers in dry farming yet remains to be considered; that is the absolute perfection with which the tree crop fits into the theory and practice of dry farming. The heart of the system is the moisture-saving earth mulch, made by keeping the ground cultivated. This is impossible when wheat or other scattered grain covers the ground, but very easy with tree crops, because the cultivator can go right up to the tree trunks at any and all times. The Tunisian Arabs, and their pupils, the Tunisian French, practise this to perfection, and it is doubtless one of the main reasons why the tree crop is more certain than the grain crop and has survived a seven-year period of six-inch rainfall with almost tropic heat.

When the earth mulch keeps the water in the ground, the tree crop can be adjusted to the amount that is there. Thus the Sfax Arabs long ago found that seven to ten olive-trees per acre could use all the water there was and make as many olives as fifty trees or one hundred trees.

Those are some of the reasons why the dry farmers of Sfax are contentedly extending their plantings in a region of such

aridity that we would omit it from our calculations of usable land. In this country dry farming has failed with disheartening frequency on large areas with greater rainfall than that of Sfax, and yet vaster areas with similar rainfall still remain an unchallanged scanty pasturage as the wastes of Sfax were for a thousand years preceding the recent awakening.

The Lesson for America

The lesson for the American lands of scanty rainfall seems plain. Develop at once a set of crop-yielding trees, so that every dry farmer can increase his chances by trying at least two of them. I do not venture to say what these tree crops should be. That is a question for the experiment stations to determine in the light of the ever-varying local conditions. I do, however, feel qualified to indicate a few probabilities.

On the western and southwestern edges of our arid belt we have rainfall distribution and temperature conditions resembling those of Sfax. The olive-tree thrives in considerable areas of the Southwest. Thrifty groves are to be found in western Texas, Arizona, and California as far up as San Francisco. It is quite possible that our plant-breeders can improve upon the variety of dry-land olive that the Arabs of Tunis inherited from the Romans, and which the Department of Agriculture has introduced into the United States. Mr. Frank Meyer, plant-explorer of the department, has recently sent cuttings of an olive-tree in Crimea that survived 2° F. when all its companions froze. This suggests the possibility of northward extension of the olive territory. The recent tripling of the price of olive-oil, and the rising price of meat and butter, indicate a field for the development of an olive-oil industry here. The labor of picking and handling the crop would certainly be reduced if we could get a hardy olive as large as one recently reported from South Africa, two or three times as large as those commonly grown. There is good reason to believe that agricultural scientists can develop satisfactory olives that will thrive on now virtually unused land, and that would enable us easily to duplicate the olive crop of the rest of the world—if we set out to do it.

Some astonishing evidence has recently come from our own arid Southwest. About twenty years ago there were some olive-plantations made on irrigated lands in districts that may properly be called desert. After the orchards were established, a failure of the irrigation supply led to abandonment. The cottonwood shade trees and the other fruit trees perished, but the olive has lived and thrived for a number of years on the natural rain-

fall of 8.11 inches per year at Phoenix and 6.88 inches at Casa Grande, Arizona.

These trees have lived in a veritable flood in comparison with a grove that was abandoned at Palm Springs, California, in 1900. This place lies in the Colorado Desert to the east of the San Jacinto Mountains. The annual precipitation "is a scant 3½ inches, with a total of only 0.70 inches for 1903, and a maximum of 9.36 inches for 1905." The 0.70-inch rainfall of 1903 fell in March. It was followed by twelve rainless months and preceded by ten months with a total of 1.40 in November and December, making twenty-three months, including two desert summers with a total rainfall of 2.10 inches. "Scant as this rainfall is, nearly all of it occurs in the six months from October to March, inclusive. During the six summer months, when a temperature of 100° F. is reached almost daily, there is scarcely a trace of rain. That any vegetation should be able to pass through this terrible ordeal of heat and drought seems beyond belief to one accustomed to the plant growths of regions having abundant rainfall; yet many species of shrubs and three species of trees are native in these hot sands."

The twenty acres of olives abandoned there have lived and grown somewhat in competition with desert shrubs on their own ground—sandy ground at that. For four consecutive years—from 1901 to 1904—the rainfall was 2.09 inches, 3.50 inches, 2.90 inches, 0.70 inches. Nor could the trees depend on subsoil waters, for the digging of an eighty-foot well found only dry cobblestone and gravel. While these trees had survived and bloomed, they had not fruited, but a very little irrigation produced a crop on others near by. The desert temperature of 120-122° F. seemed not to interfere at all. As all this was done by varieties of olives from regions of twenty-inch rainfall in Europe, there is hope of the results that may be obtained with care from the African varieties.

Tree Crops and Live Stock

But the dry farmer, especially in the Great Plains region, should be essentially a live-stock farmer, and crops that fit into this scheme are particularly welcome. The mulberry is one of the most fruitful trees man has yet found, and the delight with which pigs and poultry devour the sugary and nutritious fruit would gladden the heart of any agriculturist. In Carolina the farmers say that a mulberry-tree will feed a pig for two months and make him fat. Then there is the honey locust. That hardy and thoroughly acclimatized tree belongs botanically and economically with the mesquite, and both of them belong with the

carob. The carob bean, as has been pointed out, is an important crop in the Mediterranean countries, and the American and British farmers pay several cents a pound for it in various patent stock-foods. The carob, mesquite, and honey locusts are alike in being legumes, bearing crops of large beans in which nitrogenous seeds are packed in sugary pulp. The name "honey locust" did not come by chance. The analyses of these three beans are strikingly alike, and show surprising values in comparison with standard stock-foods. They compare as follows:

	Protein	Nitrogen free extract	Crude fibre	Fat
Carob	6.6	59.5	8.7	0.5
Mesquite	10.3	54.7	28.9	0.7
Honey Locust	4.5	69.9	14.5	2.2
Corn meal	9.2	68.7	1.9	3.8
Wheat bran	15.4	53.9	9.0	4.0

These high analyses make it clear why the Algerian farmers have recently got more than a cent a pound for their carob beans, and why the mesquite meal of Hawaii brings twenty-five dollars per ton as food for dairy cows and cavalry horses. There is no more reason why the American farmers should raise wild scrub mesquite than that they should raise wild scrub apples, and it is probably a great mistake for many of them to be bothering with grain when they have at their disposal such a water-hunting, nitrogenous food-factory, already adjusted by nature for the work.

The mesquite is at home in half a million square miles in the Southwest, and the honey locust will grow on a few hundred thousand square miles to the north of the present mesquite limits, and a million square miles eastward to the Great Lakes and the Atlantic. Accurate information about the fruiting habits of the tree is scarce. No one seems to have considered it worthy of attention. I know that cattle eat the beans greedily, and that farmers in many Eastern localities aver that it bears regularly. I have been specifically and reliably informed that a door-yard tree in Maryland has borne six consecutive heavy crops estimated at twenty bushels each. I had eleven two-bushel sacks filled under a tree that I saw in Virginia in 1912. They weighed three hundred pounds, being very bulky. A farmer in Kansas tells me that he has secured four hundred pounds from one tree. If that is the best tree in America, it is a marvelous chance. A wild tree—one of the best of timber trees—that will throw down three or four dollars' worth of cow feed is worthy of the most respectful consideration from agriculturists. Thus far it

has been neglected, while attention has been bestowed upon its inferiors.

Conclusion.

The Arab has worked out his system and won industrial contentment through his tree crop on the edge of the Desert with a rainfall of less than ten inches. May we not, by taking thought, win a similar agricultural stability in our vast areas of low rainfall where we still pray for rain and take up subscriptions for the industrially unadjusted?

I have mentioned three crop trees for the American dry-farm scientists. I mention them to prove a point, not to make a list. The botanic resources of this and other countries, as reported by plant-explorers and plant-breeders, indicate that there are many, possibly dozens, of trees that should at once become the subject of experiment. I submit that the development of tree crops is an urgent matter to which practically every agricultural experiment station in America should devote a part of its energies. This requires appropriations and the labors of patient men.

ECONOMIC ASPECTS OF INLAND WATER TRANSPORTATION

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(Concluded from November.)

IV. The Facts about European Waterways

THE experience of foreign countries has been repeatedly appealed to as evidence of the great advantages of water transportation. Investigation, however, does not bear out the contention that water transportation in Europe is cheaper than that by rail. The same faulty analysis of *cost* has been made in European countries. It has been assumed that the rates quoted tell the whole story, when as a matter of fact the rail and water rates are based upon entirely dissimilar computations. In Germany, for example, the water carriers do not charge tolls high enough to cover the overhead charges, and in consequence there is required a heavy annual subsidy. In the year 1905, for instance, the waterways of Prussia showed a deficit of $3,523.00 for every mile; while the railways yielded a net profit of $1,814.00 per mile. It is the German policy, indeed, to use the profits from railroads to offset the deficit on the waterways. In view of this can a quotation of mere rates prove waterway transportation actually

cheaper than that by rail? Suppose the situation were reversed, and that the railways were run at a heavy loss, while the waterways were conducted at a handsome profit: Would not the rates then show the railways to be more efficient carriers? It must be borne in mind in this connection that since the German government controls both railways and waterways, the fixing of rates is a mere arbitrary matter, and need have no relation whatever to cost of service.

Investigation in detail reveals the surprising fact that none of the canals of Europe and but few of the rivers serve economically as carriers of traffic. When indirect costs are included water transportation is nearly always found to be substantially more expensive than that by rail.

No doubt you are thinking that if what I have just stated be true, how is it possible that the German government, for instance, should adopt such a policy? Surely German science and efficiency could hardly tolerate, much less officially develop, so uneconomic a transportation policy. This question long baffled me in the course of my investigation of German waterway policy. The answer was first suggested to me by the eminent French economist and statesman, M. Colson, and I have since found in several other sources unimpeachable evidence in support of M. Colson's theory. The Kaiser, says Colson, believes that Germany's future is vitally dependent upon the development of her sea-power, and he "is suffering from a delusion" that the development of inland navigation is an absolute essential to the expansion of ocean commerce. Moreover, he virtually compels their development, regardless of the wishes of his subjects. In 1899 the important canal bills were defeated by the vote of the Prussian upper house, whereupon the Kaiser dismissed twenty members of the landtag and appointed others to take their places who were in sympathy with waterway development.

Transportation History of Past Century

The transportation history of the past century may be briefly summarized as follows:

In the first half of the nineteenth century the canals of both Europe and the United States were of enormous influence on economic development. During these years whether canals were publicly or privately owned tolls were everywhere levied upon the water traffic sufficient in amount to cover not only the entire cost of operation and maintenance but to cover as well the original cost of construction of the waterway itself. Indeed, since the utter inability of the old-fashioned stageroads to compete

with them gave the canals a virtual monopoly of traffic, they were exceedingly profitable sources of investment.

But in all the principal countries of the world a tremendous change took place about the middle of the 19th century. The invention of the steam locomotive and the steel rail with its great load carrying capacity, together with the perfection of the telegraph and the telephone and the development of the corporate form of industry, have ushered in a second industrial revolution perhaps even more far reaching in its consequences than the one half a century earlier.

Rapid and economical shipment of goods is no longer confined to trunk line water routes aided by such additional lines as the physical character of a country allows; for by means of a modern railway system traffic may be sent to all the points of the compass, and by virtue of the standard gauge of tracks to any destination, however distant from the original place of origin, without transshipment. In a modern industrial state, where division of labor has been carried to a great extreme and where traffic is assembled from and distributed over widely separated areas, this is of permanent importance. Herein, indeed, lies the tremendous superiority of the railways in the carrying of traffic under modern conditions.

It has been found that in Europe no less than in the United States there has occurred *pari passu* with the development of railways in the third quarter of the nineeteenth century a rapid decline in the amount of traffic carried on inland water routes. This decline has continued to the present day in England and the United States, and it has been checked only by the extending of Government subsidies to the waterways. In order to prevent the most complete diversion of traffic from the waterways it has been necessary for Governments to assume all, or nearly all, the fixed charges connected with water transportation, to pay for building, equipping, and maintaining the water routes, and to furnish them free of charge to the water carriers. When thus relieved of all save the mere direct cost of operating the boats, it is usually, though not always, possible for the water carriers to offer rates which enable them to compete with railways, which are entirely self-supporting. Even then, it is not infrequently necessary to protect the waterways still further from railway competition by arbitrarily compelling the railways to quote rates from twenty to fifty per cent higher than those by water as is the case in France and Belgium; and although the cost of transportation by water, when to the rate charged by water carriers are added the taxes levied by the state in support of the waterways

themselves, is usually much greater than that by rail, many people have still clung, strange as it may seem, to the belief that canal transportation is much cheaper than that by rail.

There can no longer be any question, however, that so far at least as *canals* are concerned, the cost of transportation, all factors included, is almost universally much greater by water than by rail. It is only in the case of very short canals which connect long stretches of naturally navigable waters that they can have any economic justification at the present time.

In the case of *rivers*, however, the situation may at times be somewhat different. But, after all, river transportation is usually analogous to that by canal, for comparatively few of our streams are really natural highways of commerce. As a rule they are navigable for the purposes of modern transportation, in name only, rather than in fact. So long as the cost of canalization of a river amounts to forty, sixty, or a hundred thousand dollars a mile, it belongs in the same category as a canal. A river like the Rhine, whose banks are firm, whose gradient is gentle, whose water supply is constant, and the cost of regulation of which is almost negligible, may, indeed, be regarded as a *natural* avenue of commerce; but a river such as the Mississippi, with ever caving sides and shifting bottoms, with periods of alternating floods and droughts, and the control of which is, in the opinion of engineers, a greater task than the building of the Panama Canal, is no more to be regarded as a *natural* highway of commerce than any artificial channel whatsoever. The test of the commercial success of such a river must lie in the cost of rendering it navigable for the purposes of modern transportation. It is only in rare instances that river transportation can be made as economical as transportation by rail.

V. Possible Indirect Gains from Waterway Development

The argument that we have just been making relates to the purely transportation feature of waterway development. It remains for us to consider some of the indirect or allied gains that might come from the development of waterways.

By these incidental advantages is meant such gains as would come from the development of waterpower, the prevention of the periodic waste in consequence of floods, and the reclamation of low-lying riparian lands. In a still broader way the problem of river control is bound up with the whole program embraced by the term conservation of natural resources. Waterways, waterpower, forestry, irrigation, reclamation of desert and flooded lands should go hand in hand and be apprehended as one com-

prehensive problem for the nation to solve. This theory must be regarded as usually pertinent in connection with river improvements, though seldom so in the case of canals; and one can be in hearty sympathy with the viewpoint, provided that it is not assumed that the cost of the waterway improvement will be covered in full by the purely transportation gains which accrue, and that the allied benefits will therefore be so much net gain to society. Unfortunately this has been the almost universal assumption of waterway advocates—an assumption which is based on the belief that water transportation costs less than transportation by rail. But if investigation of the Mississippi River, for instance, shows that extensive improvement for transportation purposes would be economically wasteful, it follows that the related aspects of the problem must be viewed in a quite different light. It may conceivably be the case that the improvement of the Mississippi River can still be proved warrantable as a part of a general conservation project; but to prove this involves showing that the gains on these non-transportation grounds would in the main be sufficient to cover the expenditures involved. If the transportation side of the problem thus becomes subsidiary, the engineers must conduct their investigations in ways different from what was appropriate when transportation was the first consideration. To take one case only, the reclamation of swamp lands and the prevention of floods might not require the construction of a fourteen- or a twenty-four-foot channel, or the erection of gigantic locks such as many consider necessary for transportation purposes. Levees alone, constructed at relatively small cost, might prove entirely adequate. Incidentally, the river thus regulated would afford some small transportation facilities. It is possible, also, that a comparatively small *additional* expense would result in a considerable increase of traffic. Hence transportation should still enter as a factor. But in any event it is clear that the problem has to be quite differently conceived when transportation is not the chief end sought, or when the direct benefits of transportation are not sufficient to warrant the project. There is need of some thoroughgoing investigation that will differentiate these aspects of the question.

THE INFLUENCE OF THE LUMBER INDUSTRY UPON THE SALT INDUSTRY OF MICHIGAN

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Introduction

IN the period of over fifty years since the first successful attempt to manufacture salt in Michigan, the industry has shown an almost uninterrupted increase in the quantity of its product.

Fig. 1.—Map showing producing salt districts of Michigan. Open circles represent present producing districts. Crossed circles represent former producing districts.

During the greater portion of this time Michigan has ranked first in both quantity and value of salt produced. While the growth of the industry has been continuous, if we neglect the few minor fluctuations, yet its geographical position has been by no means permanent. This may be seen from a glance at Fig.

1 which shows the districts that were producing in 1910 as well as those in which salt was produced during some previous period, and may be considered as a fairly accurate expression of existing conditions.

Not only have certain districts ceased production and others taken their place, but there have also been numerous ous changes in the relative rank of those districts which have continued to produce. The rise and fall of the various centers of production may be even better appreciated from an examination of Fig. 2 in which the annual production by counties, with the exception of three very unimportant ones, is indicated for the period 1875 to 1910 inclusive.* In this diagram the production of the various counties (that for Midland, Iosco, and Huron having been combined) is indicated by areas. The production of each succeeding county has been added to those below it in the diagram so that the lines indicate the combined output of all counties below them and the line AB gives approximately the total annual production of the state.

Thus we see that Saginaw county, which began production in 1860, reached its maximum in 1882 with an annual output of 1,287,273 barrels. Bay county, beginning a year later, in 1861, also reached its maximum, 1,158,279 barrels, in 1882. Huron county, beginning in 1863, reached its maximum, 326,852 barrels, in 1888. Iosco county, beginning in 1875, reached its maximum, 346,369 barrels, in 1888. Midland county, beginning in 1879, reached its maximum, 80,239 barrels, in 1882. Gratiot county produced from 1882 to 1887 inclusive, the maximum production of 6,186 barrels being made in 1883. Manistee county, beginning in 1881, reached its maximum, 2,670,094 barrels, in 1901. St. Clair county, beginning in 1883, reached its maximum, 1,632,969 barrels, in 1907. Mason county, beginning in 1886, reached its maximum, 851,669 barrels in 1909. Wayne county, beginning in 1895, reached its maximum, 1,168,629 barrels in 1906. In recent years a small amount of salt has been produced at Mt. Pleasant, Isabella Co., in connection with the recovery of bromine and calcium chloride.

This growth and migration of the salt industry has been influenced by many factors, such as the geological structure of the state, the composition of the brines, improvements in the methods of manufacture, the manufacture of table salt, consolidation and large-scale production, the development of the chemical industry, water transportation, lumber industry, etc. Of these var-

*The diagram is based upon data given in the annual reports of the state salt inspector. The abolition of that office makes it impossible to bring the diagram up to date. This however does not impair its value. These figures have been used in preference to those published by the United States Geological Survey, since the latter include the so-called brine salt used in the manufacture of chemicals and are therefore misleading in the present discussion.

ious factors the influence of the lumber industry is the most striking if not the most important, and it is only with that factor that the present paper proposes to deal.

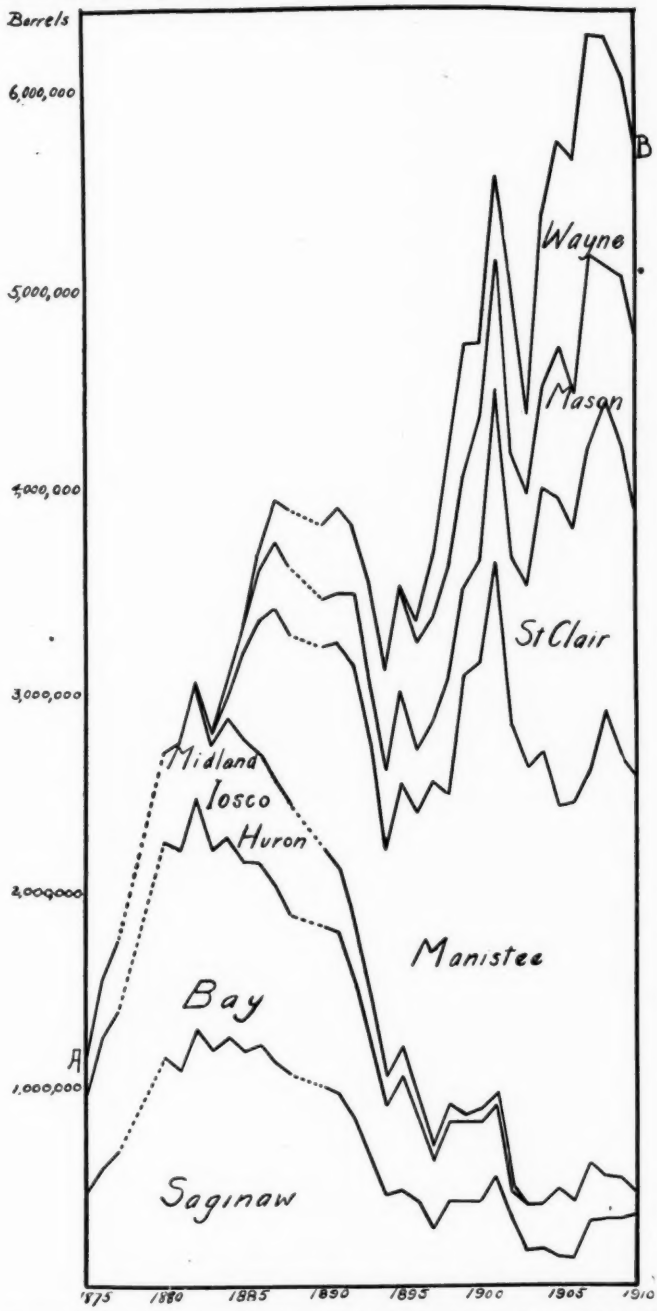

Fig. 2.—Graph showing production of salt by counties 1875-1910. For location of counties see Fig. 1.

Relationship of the Salt Industry to the Lumber Industry

One of the most striking features of the salt industry to even the most casual observer is the close relationship which has existed and to a very decided degree still does exist between the salt and lumber industries. That the very life of the former is dependent upon the existence of the latter is even now maintained by many manufacturers. While this condition may have been true in former years it is perhaps less so at the present time, at least in some districts. In Saginaw, Bay, Midland, Iosco, Huron, Mason, and Manistee counties salt has been produced almost exclusively as a by-product of the lumber industry. In both the Saginaw Bay-Lake Huron and the Lake Michigan districts the salt blocks, that is the plants used for the manufacture of salt, have disappeared with the sawmills and in some instances, as in the case at Pt. Crescent and New River, the towns themselves no longer exist. In recent years one or two blocks have been operated independently, while several have been operated in connection with other industries. In Saginaw county, the increased production in 1907, after years of gradual decline, was due to the construction of a salt block in connection with the glassworks of the Saginaw Plate Glass Co.

If the conditions in any individual district are examined, it will be found that continuous production over an extended period by any one company has been relatively rare. Even in periods of growth the increase is generally the result of the fact that the gain from new plants or companies and the increased production of the others has been greater than the loss from plants ceasing operations. As a typical but simple example let us take the Manistee district (Fig. 3).

Plant No. 1 (see Fig. 3) which was operated by Canfield and Wheeler ceased operations in 1902. No. 2 after having been operated successively by the Eureka Lumber Co. and the Manistee Lumber Co., ceased operations in 1905. No. 3 has been operated continuously by the Louis Sands Salt and Lumber Co. No. 4 was operated successively by the Canfield Salt and Lumber Co., Canfield and Wheeler, and Kitzinger and Babcock, ceasing operations in 1905. No. 5 which was formerly the largest salt block in the state, was operated by the R. G. Peters Salt and Lumber Co., the plant having ceased operations several years ago. The two wells farthest south were taken over from the Canfield Salt and Lumber Co. when they ceased operations at what was known as their Eastlake plant. No. 6 was operated successively by the Union Salt and Lumber Co., the Stronach Lumber Co., and the Dennis Bros. Salt and Lumber Co., ceasing operations in 1905. No. 7 has been operated continuously by Filer and Sons. No. 8 which was formerly operated by Chas. Rietz and Bros., and the Rietz Salt and Lumber Co. is now the No. 2 plant of the Louis Sands Salt and Lumber Co. No. 9 which was for-

merly operated by the State Lumber Co. is now the No. 2 plant of the Buckley and Douglas Lumber Co. No. 10 has been operated continuously by the Buckley and Douglas Lumber Co.

The above is a comparatively simple case and while by no means as striking as that of Saginaw and Bay counties it will perhaps serve to illustrate the point. In Saginaw and Bay coun-

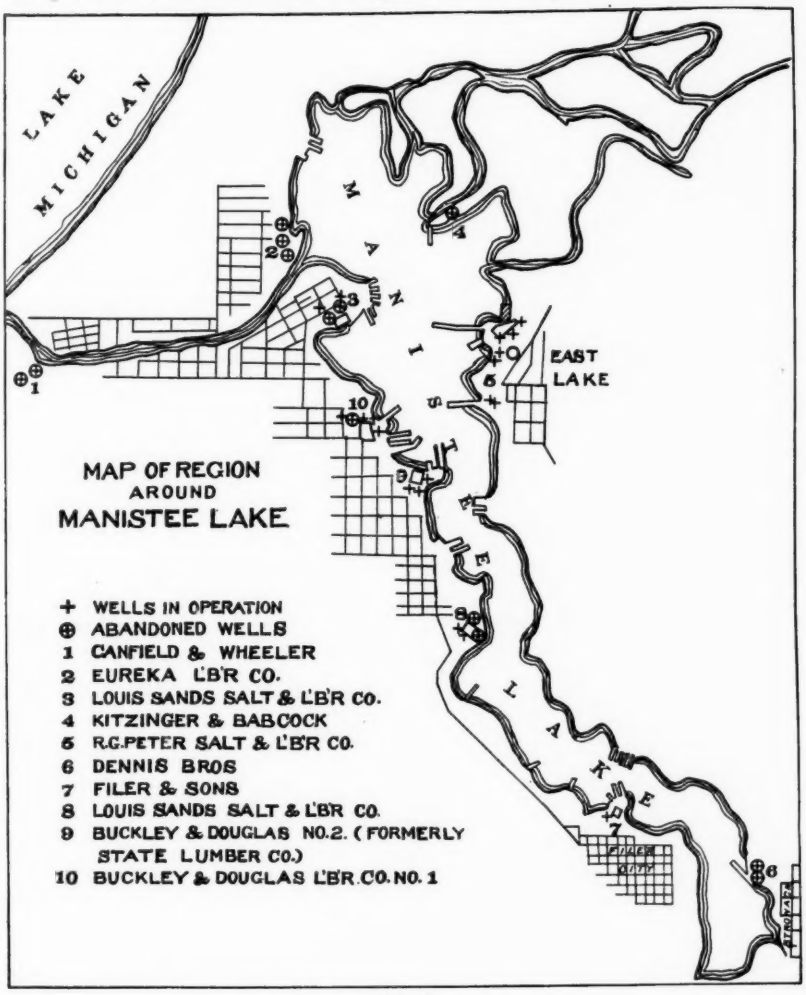
LAKE MICHIGAN
MANISTEE
EAST LAKE
MAP OF REGION AROUND MANISTEE LAKE
+ WELLS IN OPERATION
⊕ ABANDONED WELLS
1 CANFIELD & WHEELER
2 EUREKA L'B'R CO.
3 LOUIS SANDS SALT & L'B'R CO.
4 KITZINGER & BABCOCK
5 R.G.PETER SALT & L'B'R CO.
6 DENNIS BROS
7 FILER & SONS
8 LOUIS SANDS SALT & L'B'R CO.
9 BUCKLEY & DOUGLAS NO.2. (FORMERLY STATE LUMBER CO.)
10 BUCKLEY & DOUGLAS L'B'R CO. NO. 1

Fig. 3.

ties over one hundred different salt blocks have been operated in the past. Many if not most of these have been operated by several different companies and many of the companies have operated several different blocks so that the problem is exceedingly complex.

The close association of the salt and lumber industries is indictated by the names of the companies, and the transfer of the

plant from one company to another generally signifies the exhaustion of the timber supply of the older company.

The shifting of the salt industry and its dependence upon the lumber industry which we see in the case of the companies in each individual district foreshadows the migration of the center of the salt industry to a new center of the lumber industry. This is well brought out in the decline of the Saginaw Bay-Lake Huron districts and the rise of the Lake Michigan districts.

As previously stated, the first development of the salt industry occurred in the Saginaw Valley, in Saginaw, Bay, and Midland counties; and along the shores of Lake Huron in Huron and Iosco counties. Starting with an initial production in 1860, the maximum production for this area was attained in 1882 when the combined output of the five counties totaled 3,792,468 barrels. In the same year Manistee county produced 41,562 barrels. Nineteen years later, in 1901, Manistee county reached its maximum production of 2,670,094 barrels, whereas the total production of the five counties in the Saginaw Bay-Lake Huron area had declined to 972,412 barrels. Huron county had ceased production in 1897 and Midland and Iosco counties did the same in 1902.

Little mention has been made of the salt industry in the St. Clair-Detroit rivers area in St. Clair and Wayne counties. This is because the lumber industry has played but a very insignificant part in the development of the industry in this area, unless possibly we consider negative results. In this connection, it might be pointed out that although production was started in St. Clair county but two years after Manistee, it required twenty-two years to reach the million mark as against but ten years for the Manistee district. And this notwithstanding the fact that all the factors other than the lumber industry seem to favor the St. Clair district.

Causes for the Relationship of the Salt Industry to the Lumber Industry

While the salt industry would in all probability have developed eventually if the lumber industry had been non-existent, certain geographical and geological factors have pre-ordained a very close relationship between the two.

The economic factor of the relationship of price and cost of production early assigned to the salt industry the role of a by-product. That such was the case followed from the method of recovery of the salt in relation to the climatic conditions of the state. With the exception of the relatively small amount of rock

salt which has been mined near Detroit in the last few years, the entire output of salt from Michigan has been produced by the evaporation of brines, either natural or artificial. The limited period of high temperatures with abundant sunshine, and the fairly large rainfall made the utilization of the solar process—the evaporation of the brine by the heat of the sun—unprofitable, so that the use of artificial heat was necessary. Furthermore, in order that the enterprise might show a margin of profit it was necessary that the fuel should be cheap or that the salt should be produced as a by-product.

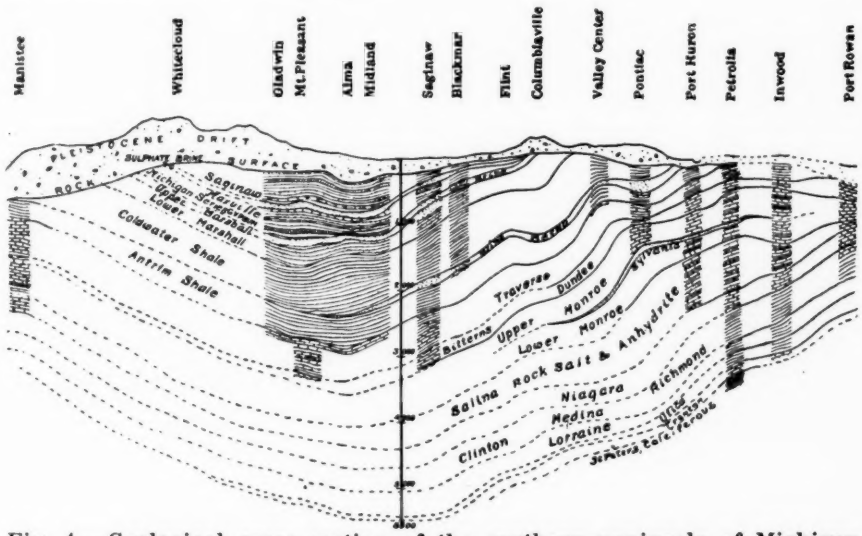

Fig. 4.—Geological cross section of the southern peninsula of Michigan showing that the most favorable places for sinking salt wells are near the borders of the state.

The early juxtaposition of the salt and lumber industries was brought about by a combination of geological and geographical factors. Fig. 4 shows that on account of the structure of the rocks of the southern peninsula of Michigan the most favorable places for sinking salt wells are near the borders of the state. Furthermore it is only in the vicinity of Saginaw and Bay City that the upper brine-bearing horizons (the Parma and Napoleon sandstones) approach the borders of the Great Lakes. A lack of appreciation of the basin structure of the state led to the failure of the first attempt to manufacture salt which took place at Grand Rapids in 1841. It was not until the appearance of Winchell's report in 1860 that there was any basis for a scientific search for brines of sufficient strength.

The year previous to the issuance of Winchell's report the state legislature had attempted to stimulate the search for salt

brines by tax exemption and bounties, and under this stimulus a well was started in that year at Saginaw by the East Saginaw Salt Manufacturing Co., the first brine being struck the next February. By July 1862 twenty-three companies were in operation or in the process of construction. In March, 1861, the state tax-exemption and bounty law was so amended that its value to the manufacturers had been practically nullified. However the salt industry had already become so closely connected with the lumber industry that it was removed from the necessity of state aid and continued to thrive.

That salt should have become a by-product of the lumber industry resulted from the fact that the region was in an early stage of development, without other industries and dependent upon water transportation. The sawmills tended to be located on streams where it was possible to float the logs to the mill. In order to make available all the timber owned by the larger companies it was also desirable that the mills should be in the lower reaches of the rivers so that the tributaries might be made use of in bringing the logs to mill and water transportation afforded for the finished product. These conditions were especially well fulfilled in the case of the Saginaw River and hence the establishment of the lumber industry at Saginaw and Bay City.

While plants using the processes for the recovery of salt which are now most largely in use (that is, processes using exhaust steam) might just as well be operated in connection with industries other than the lumber industry, such was not the case with the earlier processes in which the heat was applied directly to the receptacle containing the brine. The utilization of the offal from the sawmills as fuel for the kettles and pans in which the brine was evaporated not only made possible the economical production of salt, but likewise permitted the lumberman to extract a profit from his sawdust and slabs instead of being compelled to dispose of them in burners.

The factors which resulted in the early association of the salt and lumber industries have continued active up to the present time although perhaps with less and less potency. With the shifting of the lumber industry from the Lake Huron to the Lake Michigan districts we have seen the migration of the salt industry in the same direction; and with the decline of the lumber industry, the corresponding decline in the salt industry. However, as has already been intimated, the operation of salt blocks in connection with industries other than lumber, or the independent operation of them, which is now possible as the

result of factors with which this paper does not treat, make possible the existence of the salt industry after the lumber industry has become history.

The author is indebted to Mr. R. C. Allen, Director of the Michigan Geological and Biological Survey, for the loan of the block for Fig. 3.

COLLEGE ENTRANCE EXAMINATION ANSWERS IN GEOGRAPHY

By D. W. Johnson

Columbia University, New York City

EVERY teacher is more or less familiar with the fertility of the student mind under pressure of an examination, but even so readers of the *Journal* may be interested in some of the answers returned in the last College Entrance Examination in Geography. The examination paper included two questions on the earth as a globe, of which one was to be answered; two on the oceans, with one to be answered; three on the atmosphere, with answers required for two of them; and five on the lands, with three answers required. It will be seen that the student had considerable latitude in choosing subjects to discuss, since he might know little or nothing about five of the questions asked without that fact's affecting his grade. The answers quoted below represent the contributions of different students on topics which they felt best prepared to treat.

A question involving the origin of fogs and icebergs on the Newfoundland Banks elicited from one student the vague observation that "Dry moisture in the air cause to become fog," while another gave this vivid pen picture of the origin of bergs:

> "The icebound north, when the sun appears in the Summer, cracks open and huge masses of ice at the border and at the mouth of glaciers break off and float down the ocean."

The question relating to the physical geography of the ocean which gave most trouble was included in a list of definitions required, and called forth such replies as the following:

> "A bore is a steep slope in the ocean's bed."
>
> "A bore is the equal opening in the tubes of thermometers."
>
> "Where the elements continually wear at some rock and weathering takes place, is called a bore."

The origin of the salt in Great Salt Lake was variously accounted for. One student describes the lake as formerly "a salt inland sea" which later became "a large inland sea," thus:

> "At one time the Great Salt Lake was a salt inland sea with an outlet to the Pacific Ocean. On account of land elevation or an earthquake the outlet to the ocean was broken off and it became a large inland sea."

Another, more fertile in invention, writes:

> "Salt in any lake or ocean is due to minerals. The Great Salt Lake in Utah was formed by a glacier which transplanted many minerals of different varieties. The rain, falling into such an excavation, mingled with the minerals, which it dissolved into salt."

Replying to the question "What changes in natural conditions would make the lake fresh?", one candidate says:

> "If evaporation would take salt with it when the water evaporates, when possible, the water would sometime to come become fresh water."

Among the dangers incident to life on the banks of a mature river, the following is given:

> "The river may overflow the land, break the levees, and often changing its course, a planter may find his plantation a floating island."

Another part of the question relating to mature rivers read: "Would you rather live on the inside or the outside of a bend in the river? Why?" Many students preferred the outside of the bend, one explaining his preference in these words:

> "I would rather live on the outside of a bend in the river because the inside I am likely to parish on the inside by flood."

The choice of the following candidate is not wholly apparent:

> "But should danger prefail as on the Mississippi, surely I would not want live in side of the bend. Since dangers are not everywhere still you may chose inside."

Other replies to questions on "The Lands" contained the information that "a fjord is a steep mountain," "the fall line is the boundary between an uplifted and degrading portion of the earth's crust," and "residual soil is soil after being used by plantation, or exhausted soil." In response to a question as to what "peculiarities of topography are commonly associated with glacial erratics," one student wrote:

> "Glacier erratics are usually associated with wide level plains covered with rocks and very often petrified animals of the ancient ages are found in these states."

But the most striking contributions relate to the section on "The Atmosphere." Isotherms are defined as "lines on which the change of time is reckoned," and as "lines marking the air

currents." Horse latitudes are "the regions where the heat that has risen in the region of the thermal equator piles itself up." A request to define the term "anti-cyclone," brought highly variable results, among which were the following:

> "A cyclone may meet an opposing gust of wind which causes it to whirl in a different direction. This is called an anti-cyclone."
>
> "An anticyclone is where cool air rushes in to fill a low-land."
>
> "The anticyclone is that stillness which occurs before the cyclone."

As an explanation of "why lowlands under the trade wind belts are usually deserts," this statement was given by one writer:

> "Because the wind makes it dry and deserts are nothing but dry lands; and since there can not be or there are not any natural resources, no one could feel comfortable in such a place."

A question on "prophesizing the weather," as one student expressed it, called forth two answers worth repeating. It was required to explain why weather predictions sometimes fail. One answer was:

> "If their are conditions for producing clowdy weather he predicts clowdy weather. But when the anticyclones come on without having watched out for them, it will interfere with the cyclonical rain coming, sometimes."

Some credit should perhaps be allowed the boy who wrote:

> "As to the reason for frequent failure on the part of the forecaster, I can only say that 'Man is not infallible.'"

Eighty-seven students took the examination. Of these about one-half (forty-four) received grades of 60% or above, and one-half (forty-three) grades below 60%. Of the former group eighteen received grades above 80%. Not any of the answers quoted above were made by the fortunate eighteen. Of the group falling below 60%, twelve had grades lower than 30%. Most of the answers quoted were made by these twelve. Five of the twelve were recommended by their teachers as ready to take the examination, five others had the teachers' consent to take it, while two entered the list on their own responsibility.

THE PORT OF KOBE

By WALTER N. LACY
Foochow, China

YOKOHAMA, Kobe, and Nagaski are the three ports of Japan most familiar to the general traveller. This is because all three of them are touched by most or all of the steamers plying between China and Japan and North America to the east, and Europe to the far west, and of these three Yokohama is generally given credit for being the leading port of Japan. A day spent in each of these ports recently has led the writer to the conclusion that Kobe is the one naturally best suited to develop into an important port; also to the conclusion that today Kobe is commercially more important than Yokohama—a conclusion that was verified by one of the ship's officers who stated that more shipping is now handled at this port than at Yokohama. Opportunity was not had for the acquisition of statistics to show what has been done, nor of customs reports to show how the city ranks commercially; all that is attempted in this paper is the record of a few observations made from the ship while in the harbor for a few hours.

Kobe is situated on the southern coast of Nippon, the largest of the islands of Japan, and near the eastern end of the Inland Sea of Japan. Although the city has a population of over 300,000, and but slightly less than that of Yokohama and about twice that of Nagaski, it is not mentioned among the "Principal Cities of Japan" described in Rand, McNally & Co.'s 1916 *Pocket Atlas of the World*. Yokohama derives its chief importance, no doubt, from the twofold advantage of its location as the port of Tokyo —the capital of Japan and the largest city in Asia—and as the port nearest to the coast of North America; hence it is the first point of call for westward-bound trans-Pacific steamers, and furnishes the last chance for passengers, freight, and mails to catch steamers bound for the United States and Canada. Kobe derives its chief importance from its location, to which is added splendid harbor facilities: it is centrally located to the densely populated region south of the mountain range which forms the backbone of the island; and with the cities and towns of this region, in both directions from Kobe, it has good rail connections. It is some twenty-four hours nearer China and Korea than is Yokohama and is therefore the eastern terminal for steamer lines connecting Japan with Tientsin and Fusan; it is but a short distance by rail from Kanagasaki, on the north side of the island, which is about thirty-six hours from Vladivostok, and hence

Kobe is the port of reshipment for American goods destined for Siberia. Kobe is also the port for Kyoto and Osaka, the one the ancient capital and today the second city of the empire, while the other is Japan's greatest manufacturing city; Moji and Shimonoseki, at the western entrance to the Inland Sea, are some twelve or fifteen hours nearer the ports of the Asiatic mainland than is Kobe, but have less satisfactory harbor facilities for trans-shipping. These facts all conspire to further the commercial development of Kobe.

The city of Kobe lies spread along the narrow plain at the foot of a wall of mountains some 1500 feet in height, and facing a crescent shaped bay on the north of Osaka Bay. Viewed from the harbor there appears to be little width to the city, as it begins to climb the mountain slopes, but great length along the water front. But this water front presents the most commercial aspect of any water front that the writer has seen in Japan. Towards the western end of the harbor large ship-building yards are to be seen, including a 7000 ton floating dock, and there is abundant evidence that Kobe is developing its ship-building and machine-manufacturing industries. In the central part of the water front four or five large stone piers are at present being constructed, extending about a thousand feet out into the harbor, and equipped with derricks and warehouses for the handling of freight; these will soon reduce the number of steamers that must tie to buoys in the harbor and transfer freight to lighters for rehandling at the shore. At a distance of half a mile from the shore a stone breakwater has been built to serve as a partial protection to shipping in the harbor; the natural wall of mountains affords this protection on the north and east, from which the stormiest winds probably come. Thus it is seen that the people of Kobe are artificially increasing the advantages which nature has already given their city.

A large part of the freight which passes through this port is consigned to or received from China, Korea, and Siberia, and is trans-shipped here to or from steamers plying between the Orient and America. British and Japanese steamers at present have a practical monopoly on the Pacific, yet they carry chiefly American goods to and from the Asiatic markets: practically the entire cargo of the British vessel on which the writer recently crossed the Pacific consisted of American goods. There was a large shipment of cotton machinery going from Newton Upper Falls, Mass., to equip cotton mills at Tientsin; there were several hundred bales of leather "M'f'd in U.S.A." going to Moscow, via Vladivostok, to be used largely for saddles; there were about a

hundred casks of cocoanut butter from Chicago, destined for Vladivostok. All these were trans-shipped at Kobe to go by local steamers to Tientsin and Vladivostok. There was also a considerable shipment of general merchandise unloaded in Kobe, destined for Tientsin, Korea, and parts of Japan, and several score sacks of bones—the product of American slaughter houses to be used in the manufacture of paper by the Japanese. But yet more interesting, perhaps, because of the circuitous route necessitated by war conditions, were the thousand sacks of parcels post mail from London and Liverpool for Petrograd and Moscow, sent "via Canada and Kobe" (as the sacks were marked).

Thus, while British and Japanese steamers are practically the sole carriers in the trans-Pacific trade, American goods are finding a market in Oriental cities; war conditions have increased the trans-Pacific shipping and the trans-shipment in Japanese ports; and Kobe is growing, because of her position and her harbor facilities into the chief commercial port of Japan.

A RECOMMENDED LIST OF ESSENTIALS IN PLACE GEOGRAPHY

Prepared by Committee of Chicago High School Teachers composed of V. C. Bell, T. M. Davies and H. D. Smith.

1. *Mathematical Points, Lines and Divisions.*—North Pole, South Pole, Equator, Tropic of Cancer, Tropic of Capricorn, Arctic Circle, Antarctic Circle, Torrid Zone, North Temperate Zone, South Temperate Zone, North Frigid Zone, South Frigid Zone, Prime Meridian, Meridian 180°, Meridian 90°W., Meridian 90°E., Parallel 40°South, N. Hemisphere, S. Hemisphere, E. Hemisphere, W. Hemisphere.

2. *Continents.*—North America, South America, Europe, Asia, Africa, Australia, Antarctica.

3. *Oceans.*—Atlantic, Pacific, Indian, Arctic, Antarctic.

4. *Seas, Gulfs, Bays, etc.*—Baffin Bay, Bering Sea, Puget Sound, Gulf of California, Hudson Bay, Gulf of Mexico, Caribbean Sea, Gulf of St. Lawrence, Chesapeake Bay, Delaware Bay, Panama Bay, Baltic Sea, North Sea, Finland Gulf, Bothnia Gulf, Irish Sea, Bay of Biscay, Mediterranean, Black Sea, Adriatic Sea, Aegean Sea, Sea of Marmora, Sea of Azov, Okhotsk Sea, Japan Sea, Yellow Sea, South China Sea, East China Sea, Bay of Bengal, Arabian Sea, Persian Gulf, Gulf of Aden, Red Sea, Java Sea, Gulf of Guinea.

5. *Islands and Groups of Islands.*—Aleutian Isles, Vancouver Island, West Indies, Cuba, Hayti, Porto Rico, Jamaica, Long Island, Newfoundland, Greenland, Tierra Del Fuego, British Isles—Great Britain, Ireland—Iceland, Azores, Canary Islands, Corsica, Sardinia, Sicily, Malta, Crete, Cyprus, Japanese Islands, Formosa, Ceylon, East Indies, Sumatra, Java, Borneo, New Guinea, New Zealand, Philippines, Samoa Islands, Hawaiian Islands, Guam Island, Cape Verde Islands, Madagascar, Tasmania.

6. *Straits, Channels, and Sounds.*—Bering Strait, Yucatan Channel, Florida Strait, Long Island Sound, Mackinac Strait, Strait of Magellan, Kattegat, Skager Rack, English Channel, Strait of Dover, Gibraltar, Messina Strait, Bosporus, Dardanelles, Korea Strait, Malacca Strait, Sunda Strait, Bab-el-Mandeb, Mozambique Channel.

7. *Peninsulas.*—Alaska, Lower California, Yucatan, Florida, Nova Scotia, Labrador, Scandinavian, Jutland, Spanish, Italian, Grecian, Crimea, Balkan, Kamchatka, Korea, Indo-China, Malay, Arabian, Asia Minor.

8. *Isthmuses.*—Panama, Suez, Tehuantepec.

9. *Capes.*—Cod, Hatteras, Horn, Lands End, Good Hope, North Cape.

10. *Plains.*—Great Central of N. A., Atlantic Coastal, Valley of California, Llanos, Selvas, Pampas, Lowland of Europe, Hungarian, Lombardy, Siberian, E. China, N. India, Mesopotamia.

11. *Plateaus.*—Columbia R., Colorado, Alleghany, Cumberland, Piedmont, Ozark, Mexican, Bolivia, Central Africa, Abyssinia, Tibet, Pamir, Deccan.

12. *Mountain Systems and Ranges.*—Cordilleras, Rocky, Sirra Madre, Sierra Navada, Cascade, Coast Ranges, Appalachian, Adirondack, Andes, Brazilian, Scandinavian, Pennine, Alps, Pyrenees, Cantabrian, Apennine, Carpathian, Caucasus, Ural, Atlas, Himalaya, Hindu Kush, Australian Alps.

13. *Peaks.*—McKinley, St. Elias, Rainier, Shasta, Lassen, Whitney, Mitchell, Orizaba, Chimborazo, Cotopaxi, Aconcagua, Blanc, Matterhorn, Etna, Vesuvius, Hecla, Kilimanjaro, Everest, Ararat, Sinai, Fujiyama, Mauna Loa.

14. *Deserts.*—Great American, Atacama, Sahara, Kalahari, Gobi, Arabian, Australian.

15. *Lakes.*—Great Bear, Great Slave, Superior, Michigan, Huron, St. Clair, Erie, Ontario, Champlain, Great Salt, Nicaragua, Titicaca, Ladoga, Chad, Victoria Nyanza, Tanganyika, Nyassa, Caspian Sea, Aral Sea, Baikal, Dead Sea.

16. *Rivers.*—Mackenzie, Nelson, Saskatchewan, Red River of the North, St. Lawrence, Ottawa, Niagara, Detroit, St. Clair, St. Marys, Merrimac, Hudson, Delaware, Potomac, Mississippi, Red, Arkansas, Ohio, Tennessee, Cumberland, Missouri, Rio Grande, Colorado, Sacramento, Columbia, Snake, Frazer, Yukon, Orinoco, Amazon, Madeira, Sao Francisco, Plata, Parana, Dvina, Vistula, Oder, Elbe, Weser, Thames, Rhine, Clyde, Seine, Loire, Tagus, Tiber, Rhone, Po, Danube, Dnieper, Don, Volga, Nile, Niger, Congo, Orange, Zambezi, Ob, Yenesei, Lena, Amur, Hoang Ho, Yong-tse Kiang, Mekong, Brahmaputra, Ganges, Indus, Euphrates, Tigris, Murray.

17. *Countries and States.*—Canada, British Columbia, Alberta, Saskatchewan, Quebec, Manitoba, Ontario, New Brunswick, United States—Maine, New Hampshire, Vermont, Massachusetts, Tennessee, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky, Arkansas, Louisiana, Texas, Oklahoma, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, North Dakota, Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Idaho, Washington, Oregon, California, Alaska, District of Columbia, Mexico, Central America, Panama, Colombia, Venezuela, Guiana, Brazil, Paraguay, Uruguay, Argentina, Chile, Bolivia, Peru, Ecuador, Russian Empire, Russia, Norway, Sweden, Denmark, England, Scotland, Wales, Netherlands, Belgium, German Empire, France, Spain, Portugal, Switzerland, Austria-Hungary, Servia, Rumania, Bulgaria, Turkish Empire, Greece, Morocco, Algeria, Tripoli, Egypt, Sudan, Abyssina, Guinea, Belgian Congo, Union of South Africa, Siberia, Turkistan, Syria, Palestine, Persia, Afghanistan, India, Siam, Chinese republic, China, Manchuria, Korea, Japanese Empire, Japan, New South Wales, Victoria.

18. *Cities.*—Halifax, Quebec, Montreal, Ottawa, Toronto, Winnipeg, Boston, Fall River, Lowell, Providence, New Haven, Worcester, New York, Brooklyn, Albany, Rochester, Buffalo, Philadelphia, Pittsburg, Newark, Jersey City, Paterson, Washington, Richmond, Charleston, Atlanta, Savannah, Mobile, Birmingham, Memphis, Louisville, New Orleans, Galveston, San Antonio, Cincinnati, Columbus, Cleveland, Toledo, Indianapolis, Chicago, Detroit, Grand Rapids, Milwaukee, Minneapolis, St. Paul, Duluth, St. Louis, Kansas City, Omaha, Denver, Salt Lake, Seattle, Portland, San Francisco, Los Angeles, Oakland, San Diego, Mexico, Vera Cruz, Havana, Bogota, Bahia, Rio de Jan-

eiro, Montevideo, Santos, Buenos Aires, Santiago, Valparaiso, Lima, Quito, London, Liverpool, (Eng.) Birmingham, Manchester, Portsmouth, Newcastle, Bristol, Sheffield, Cardiff, Glasgow, Edinburgh, Dublin, Belfast, Paris, Marseilles, Lyons, Bordeaux, Le Havre, Madrid, Barcelona, Lisbon, Oporto, Brussels, Antwerp, The Hague, Amsterdam, Rotterdam, Copenhagen, Christiania, Stockholm, Petrograd, Moscow, Odessa, Warsaw, Kiev, Berlin, Hamburg, Bremen, Frankfurt, Cologne, Munich, Dresden, Leipzig, Breslau, Stettin, Vienna, Budapest, Prague, Trieste, Rome, Genoa, Milan, Turin, Venice, Naples, Palermo, Bukarest, Constantinople, Athens, Alexandria, Cairo, Port Said, Algiers, Tunis, Cape Town, Johannesburg, Kimberley, Smyrna, Damascus, Jerusalem, Mecca, Aden, Teheran, Calcutta, Bombay, Madras, Bangkok, Singapore, Peking, Canton, Shanghai, Hong Kong, Tientsin, Hankow, Tokyo, Yokohama, Osaka, Vladivostok, Manila, Batavia, Sydney, Melbourne, Adelaide, Auckland, Honolulu.

19. *Miscellaneous.*—Great Interior Basin, Gulf Stream, Japan Current, Labrador Current, Grand Bank, Grand Canyon, North Magnetic Pole, Klondike, Yosemite Valley, Yellowstone National Park, Khaibar Pass, The Prairies, Niagara Falls, Victoria Falls, St. Anthony's Falls, Stanley Falls, Suez Canal, Panama Canal, The Caspian Steppes, The Tundras, The Fall Line, The Everglades, Death Valley, Salton Sink, Kaiser Wilhelm Canal, Erie Canal, Soo Canals, Welland Canal.

CURRENT MATERIAL FOR THE GEOGRAPHY TEACHER

Baltimore Harbor and Channel

The port of Baltimore is 11 miles distant from Chesapeake Bay and connected with it by the Patapsco River. Above the city the river is a narrow and shallow flowing stream, while below it is an inlet of Chesapeake Bay, varying in width from one to four miles. Before improvement by the Federal Government there was a low-water depth in Patapsco River of about 17 feet and vessel cargoes frequently had to be lightered about 14 miles below the city from deep water in the bay.

The original project of improvement was adopted in 1836. It authorized the deepening of the harbor of Baltimore without specifying dimensions. Under four later projects the harbor and channel were successively deepened and widened at a total cost of $4,776,000. The present project for the Baltimore channel was adopted in 1905. It provides a low-water channel 35 feet deep and 1,000 feet wide between the 35-foot contours in Chesapeake

Bay and the same depth, 600 feet wide, up to the Patapsco River as far as Fort McHenry, with an anchorage basin 35 feet deep, 600 feet wide and 3,500 feet long. The total length of the dredged channel amounts to about 24½ miles. The work is now complete at a total construction cost of about $3,441,000 or $330,000 less than the estimate, and Congress provides an annual allowance for maintenance. The so-called inner harbor of Baltimore is in course of improvement by the city, and upon completion of work now undertaken the channel depth of 35 feet will be carried to most of the wharves along the water front. The city has also expended $6,160,000 on municipal docks and has available $5,000,000 more for extending the system.

A subsidiary harbor for Baltimore which will, no doubt, be of great value is Curtis Bay, another tidal arm of the Patapsco River about six miles southeast of the present harbor. The channel is 30 feet deep, 250 feet wide and a little over two miles in length. There is considerable traffic in sugar at Curtis Bay, and the Baltimore and Ohio Railroad has constructed a coal terminal. Spring Garden Harbor is another tidal arm of the Patapsco to the south of Baltimore, navigable for about four miles, with a channel 27 feet deep and 150 feet wide, and a turning basin at the upper end. There is considerable traffic in brick on this harbor, and the Western Maryland Railway has built an extensive coal terminal there.

Altogether, therefore, Baltimore is provided with three connecting harbors, a main ship channel of 35 feet, Curtis Bay 30 feet and Spring Garden Harbor 27 feet, all susceptible of ultimate development to uniform dimensions.—[W. H. Schoff in *Commercial America.*]

The Nizhni-Novgorod Fair of 1916

In spite of the considerable modernization of trade methods in Russia during the last forty years, fairs, a mediaeval form of concentrating and marketing goods, have survived and are still playing an important, though gradually declining part in that vast Empire.

Irbit Fair, in Irbit, Province of Perm, Kiev Contract Fair, in Kiev, Epiphany Fair in Kharkoff, but above all the yearly Nizhni-Novgorod Fair, in Nizhi-Novgorod on the Volga and Oka rivers, are even now of great importance in the internal trade of the country.

As regards the significance of this latter fair for international trade, while recognizing that in transactions of Russia with the Orient, in marketing of certain kinds of foreign goods, and

for the sale to foreign buyers of such raw materials as furs, hides and skins, it is of considerable importance, one must not exaggerate the necessity of direct participation of American firms interested in the distribution of their manufactures on the Russian market in this Fair.

Originated long before the era of railways and steamship navigation on the internal waterways of Russia, the Nizhni-Novgorod Fair used to bring together European and Oriental merchants with those from all over Russia. With the development in the Empire of modern transportation facilities, telegraph and telephone communication, large credit institutions, etc., the traditional part played by the Fair is losing ground in an ever increasing number of articles. The establishment of permanent warehouses by the large Moscow textile firms, supplying the demand for textiles all the year round, in such centers as Omsk for Siberian trade and Ufa for the Urals, has resulted in the considerable decrease of the turnover at the Fair in textiles, of late. Again, the proposition, already submitted for consideration of the Ministry of Trade and Industries, to create at some central point in Russia such fur auctions as would centralize the bulk of the country's fur trade, is threatening another important commodity dealt in at the Fair in huge quantities. Tea trade, except in brick tea, has for some time been diverted to large wholesale firms specializing in that branch of commerce.

No doubt that conditions resulting from the present war have demonstrated in a pronounced way that even the old traditional Nizhni-Novgorod Fair must give way to the powerful influence of modern efficient business methods. However, in view of the fact that the business transacted at this year's Fair throws an interesting light upon the general conditions of demand and supply in Russia, as also upon the prevailing prices, a short review of the Fair is given herewith:

The chief feature of this year's Fair was the enormous shortage of goods, resulting from Russian industries producing mainly war supplies, also the depletion of reserve stocks of past years, along with the difficulties of transportation. In comparison with the Fair of 1914, the last normal year, the quantity of goods brought to the Fair was already in 1915 22.7% smaller, and in 1916 this shortage increased to 36%. Similarly the number of firms participating in the Fair, 2,920 in 1913 and 2,653 in 1914, decreased to 2,082 in 1915 and as few as 1,496 in this year's Fair.

Considerably higher prices account for the big turnover, in spite of the small supplies. Of iron goods there was 50% less than

last year; of anvils and forge bellows there was only 15% and of hunting guns 40% of last year's supply. The quantity of sewing machines and typewriters brought to the Fair was just 10% of last year's, whereas the prices were some 200% higher.

The transactions in chemicals show enormous increases of prices when compared with those of 1915.

As regards the textiles, of cotton goods there was delivered only about 20% of the usual quantity, which supply was bought out with feverish haste at very high prices. With regard to cloth and woolens the position was still more difficult as even in normal times Russia has to rely to a great extent on foreign raw material; whereas the demand for the army is of enormous proportions, the supply of foreign wool has been made difficult and the home production owing to decrease of country sheep stock has become much smaller. In consequence of this great shortage of woolens for private use, rough woolens used by peasants sold at about 270%, and finer woolens at about 360% higher than in 1914, and as much as 190% more than in 1915.

The flax crop of Russia in the last two years, owing to the occupation of some western provinces of the Empire, has been much below the normal. This, along with the increased demand for linen for the army, resulted in only hemp fabrics being offered for sale, these being produced by the peasants in quite considerable quantities. Generally speaking, in textiles peasant cottage producers have brought to the Fair quantities considerably larger than heretofore, but not satisfactory from a quality point of view.

The demand of Caucasus and Persia for bright, Oriental fabrics, requiring special dyes, could only be satisfied to a very small extent, and at fabulous prices, owing to either complete shortage or impossible prices for certain kinds of dyes.

Large business in furs was characterized by speculation based on expected foreign and domestic trade opportunities. "Karakul" furs were brought to this year's Fair in a record quantity of about three million skins, but were released for sale only in small lots and with a constantly growing tendency of prices. —[*The Americas* for Oct.]

NEWS NOTES

Nebraska Council of Geography Teachers

Thursday, November 9, 1916, was a red letter day for Geography and geography teachers at the Nebraska State Teachers' Association at Omaha.

The first event of the day was a meeting of the Council at

the Hotel Rome from eight to ten o'clock in the forenoon. This session was exclusively for those especially interested in geography teaching and, despite the early hour, was attended by nearly fifty people, representing the State University, the four State Normals, several denominational colleges, and the principal city schools. The Nebraska Council had three committees at work to prepare a systematic course of study in geography extending from the lower grades through the High School. The preliminary reports given by the respective chairmen,—Miss Rose Clark, Peru Normal, on Geography in the Grades; Miss Jeanette C. Nelson, University of Nebraska, on Geography in the Junior High School; and Professor A. J. Mercer on Geography in the High School,—proved very interesting and instructive. The committees were continued, so within another year results of great value are expected. Professor E. E. Lackey presented a brief report on Geography Measurements that attracted much attention. This meeting also gave the members of the council opportunity to meet Professor Whitbeck at close range. His talk was rich in suggestions for the organization and was most highly appreciated.

The other meetings of the day followed in rapid succession. Professor Whitbeck gave addresses at three large section meetings at each of which geography was emphasized. The session of the Geography Section, presided over by Professor Mercer was one of the largest of the State Association. The program follows:

"Motivating Geography"—Miss Sue Wilson, Lincoln.

"The Relation of Geography and Geology"—Miss Anna L. Hinterlong, University of Nebraska.

"Essentials of Geography"—Hon. A. O. Thomas, State Superintendent.

"The New Movement in Geography"—Professor R. H. Whitbeck.

There were about 450 in attendance at this meeting and a number were turned away on account of lack of room. The officers elected for next year are:

Professor N. A. Bengtson, University of Nebraska, President.

Miss Elizabeth Bettcher, Wayne State Normal, Vice President.

Miss Olive Griffith, Blair, Secretary.

The last geographic meeting of the day was featured by a lecture illustrated by motion pictures on Nebraska Resources by Professor G. E. Condra of the University of Nebraska, at the City Auditorium. This meeting was attended by several hundred and

demonstrated the use of new illustrative material in geography teaching.

Summarizing, it is estimated that at least a thousand teachers heard Professor Whitbeck and that nearly fifteen hundred heard some phase of geography ably discussed at this year's meetings. The Council membership has more than doubled and plans for next year are already well under way. The Council movement is producing results in Nebraska. N. A. BENGTSON, State Leader.

MEETING OF THE MINNESOTA GEOGRAPHY TEACHERS

The Minnesota Council made an excellent showing at its meeting in St. Paul on November 3rd. The meeting was held in the Hotel St. Paul. Fully 300 teachers were present. The speakers were Supt. L. L. Everly of St. Paul; Miss Bessie Knight of Minneapolis, and Prof. R. H. Whitbeck of the University of Wisconsin. The dominant note in all of the papers was The Minimum Essentials in Geography. All emphasized the need of selecting a certain body of geographical facts and principles and then making sure that these essentials are taught and reviewed until they become a permanent part of the pupils' equipment for life.

Minnesota is fortunate in having a considerable number of enthusiastic geographers in positions of influence in the state. Prof. C. J. Posey is in the State University; Geogre J. Miller is at the Mankato Normal; Eugene Van Cleef is at the Duluth Normal; S. S. Visher is at the Moorehead Normal, and R. J. Scarborough at the Winona Normal. L. L. Everly who has been many years a teacher of geography is now one of the superintendents in St. Paul.

The newly elected officers of the Minnesota Council are C. J. Posey, president; L. L. Everly, vice president; Bessie P. Knight, secretary-treasurer.

Minnesota may be counted upon to do its part in the rejuvenation of geography.

MEETING OF THE KANSAS TEACHERS

The geography teachers of Kansas completed the organization of the State Council on November 10th at the annual meeting of the State Teachers Association of Topeka. Miss Jane Atwood, State Leader, had counted upon a meeting of about fifty teachers; between 200 and 300 crowded the room using all available standing room and a considerable number were turned away.

Miss Lucy McCoy read a paper on "Geography at the School of Education, Chicago, in the Summer of 1916," and R. H. Whit-

beck spoke on the "New Movement in Geography." A constitution for the State Council was adopted and officers for the following year were elected. Miss Jane Atwood of the Emporia Normal was chosen president. Six directors, with terms of one, two, and three years, respectively, were elected; namely, Miss Jennie Williams and Supt. Senter for one year; Miss Eulalie Roseberry and Miss Bessie Bixby for two years; and Professor L. D. Wooster and John Lofty for three years.

The new Kansas organization started off vigorously as Kansas organizations have a habit of doing.

MEETING OF WISCONSIN TEACHERS AT MILWAUKEE

At the meeting of the Wisconsin Council a year ago, W. J. Sutherland was made president. His death soon afterward left the Council without a leader and the work which had been outlined for the year was halted. Miss Lilla Braband of Milwaukee, vice president, presided at the council meeting of Nov. 2nd. Several new members were admitted and it was definitely decided to increase the State Council to 40 or 50 members. R. H. Whitbeck of the State University was elected president for next year; Miss Lilla Braband, vice president, and E. G. Lange of the Whitewater Normal, secretary-treasurer.

At the Geography section of the State Teachers' Association, the program was largely devoted to papers and discussions on the Relation of General Science to Physical Geography in the High School. State Inspector Terry spoke in advocacy of General Science and Miss Sarah Dickie of Waukesha defended Physical Geography.

PROBLEMS FOR INDUSTRIAL GEOGRAPHY

1. Though Great Britain and Germany are old and, in many ways, more advanced than the United States, yet the manufactures of both together are less in value than those of the United States alone. Give reasons for this.

2. Give 5 to 10 reasons for the great development of manufacturing in the United States. Select the five reasons which you regard as the most important, and tell why you selected them.

3. While the United States produces twice as many manufactured goods *in value* as Great Britain does, it has more than twice the population of Great Britain and more than 30 times the area. Which of the two countries should be ranked first *as a manufacturing nation?* Give your reasons.

4. Both Russia and China are larger and more populous than the United States; both have great natural resources, in-

cluding coal and iron, and they have an invigorating climate; why are they not among the prominent manufacturing nations?

5. Account for the fact that prior to the present time the United States exported fewer manufactured goods than Great Britain.

6. What is a tariff? a protective tariff? Why called "protective"? How does a protective tariff help to build up a nation's manufacturing industries? Does such a tariff make goods more expensive to the consumer? Be prepared to defend your answer.

7. Cheap fuel is almost necessary in building up manufacturing industries, yet neither New England nor New York has coal deposits. Explain this apparent contradiction.

8. Suppose you desired to enter into some manufacturing enterprise on a large scale; in what part of the United States do you think you would locate—

(a) a meat-packing industry?
(b) a paper mill?
(c) a cane sugar refinery?
(d) a cotton mill?
(e) a steel making plant?
(f) a silk mill?

Might there be several places equally advantageous for each of these? Explain. With respect to each of the above industries, name sections of the country where you certainly would *not* locate it. Give reasons.

9. The states of Ohio, Indiana, and Illinois, as a group, rank high in agriculture, in manufacturing, in mining, and in railway mileage. Give some of the reasons. Which one of the four is essential to the success of all the others?

10. Give reasons why the South has devoted less attention to manufacturing than the North. Why is manufacturing less developed in the West than in the East? Many people in the South do not desire mills and factories in their midst. Suggest reasons.

11. Suggest reasons for each of the following facts:

(a) Manufacturing has developed faster along the Great Lakes than along the Mississippi;

(b) on the shore of Lake Michigan than on the shore of Lake Huron;

(c) on the shore of Lake Erie than on the shore of Lake Ontario;

(d) along the Ohio than along the Missouri;

(e) on the Atlantic coast of the United States than on the Pacific coast;

(f) along the North Atlantic coast of the United States than along the South Atlantic coast.

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